Park News

Great Basin National Park
National Park Service
U.S. Department of the Interior

The Midden

The Resource Management Newsletter of Great Basin National Park

Bonneville Cutthroat Trout in Fourth Stream

By Gretchen Baker
On Friday, May 6, Great Basin National Park along with partners and volunteers reintroduced Bonneville cutthroat trout into a fourth park stream. This native trout originally occupied six of the park's ten perennial streams.

Photo by J. Blalack, NPS

Participants in Bonneville Cutthroat Trout Restoration

Participants in the all-day fish restoration included the Nevada Department of Wildlife, U.S. Forest Service, Trout Unlimited, and the local high school biology class from Eskdale, Utah. Forty-six Bonneville cutthroat trout were captured from Hendry's Creek, located in the North Snake Range, and transported to Upper Snake Creek in the South Snake Range. Bonneville cutthroat trout spawn in early July, so by the end of summer the population should be larger, with potentially hundreds of young-of-the-year fish joining the population.

Future plans for the Bonneville cutthroat program are to move additional fish into Snake Creek in the fall and to restore Bonneville into South Fork Baker Creek, making it the fifth park stream to contain the native trout. In addition, this summer the park will begin to restore the aquatic ecosystem of the Bonneville cutthroat streams by reintroducing non-game fish that were also extirpated along with the native trout.

In This Issue

Sage Grouse Return

By Neal Darby
Sage grouse have been absent from Snake Valley for several years for unknown reasons. Their absence has been documented by park staff, who began conducting surveys in 2000 of historic lek sites. Leks are areas where male birds congregate and perform spectacular strutting displays to gain the attention of female birds. Not a single grouse was seen at these leks for four years.

Last October four male sage grouse were spotted and captured on the Baker Ranch. The Nevada Department of Wildlife (NDOW) fitted each grouse with a telemetry transmitter harness that fits over the grouse's wings and holds a radio transmitter in the center of its back. The harness does not restrict the grouse's wing movement so it can fly if chased by predators. Biologists from Great Basin National Park, Bureau of Land Management (BLM), and NDOW used telemetry to follow the birds and determine their distribution and numbers in Snake Valley.

During the spring, the birds began to strut, allowing us to locate their leks, which consisted of one primary lek and four satellite leks east of the Kious Basin. The primary lek is where the birds strut most frequently, while satellite leks are used less frequently. The strutting occurred most mornings beginning just before sunrise and

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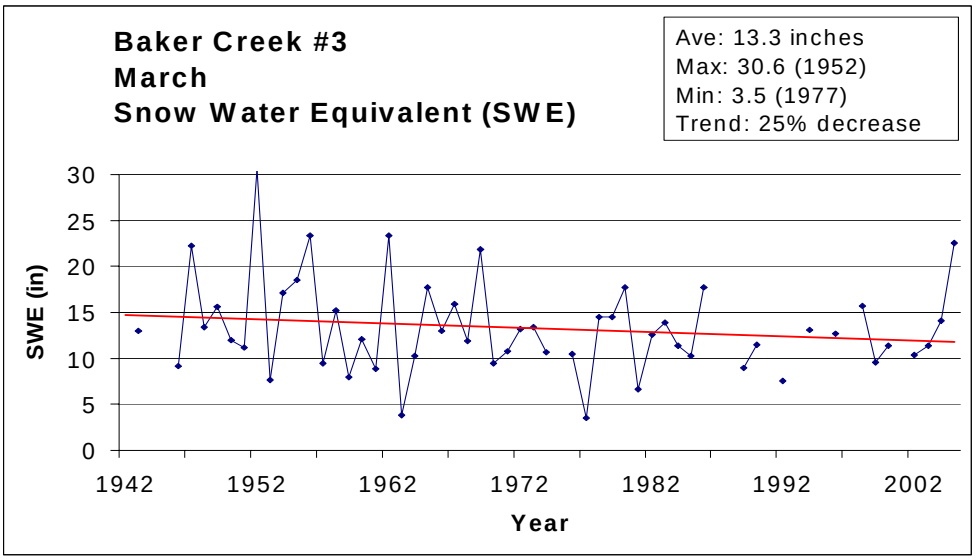
Snow Surveys Show Declining Trend Despite High Snow in 2005

by Gretchen Baker

Although Eastern Nevada has received huge amounts of snow in 2005, the average amount of snow falling on the Snake Range has gradually decreased over the decades, according to 63 years of snow records.



Snow surveys began in the area that is now called Great Basin National Park in 1942 and have continued annually. The snow survey sites are located in the Baker Creek watershed at elevations of 8,220 feet, 9,200 feet, and 9,520 feet. The sites are visited at the beginning of March and April by the Natural Resources Conservation Service accompanied by park staff and volunteers. The team takes 5 to 20 measurements at regular intervals along the snow course using a lightweight graduated aluminum tube and a scale to determine snow depth and snow water equivalent. The snow depth is determined when the tube is pushed into the snow to the ground. When the tube is removed, the core of snow is weighed using a scale that reads directly in inches of snow water equivalent.

Graphs of these snow surveys show a downward trend in both the snow depth and snow water equivalent for most of the three sites. Years with the largest snow amounts were 1952, 1969, and 2005, and years with the smallest snow amounts were 1953, 1972, 1977, and 1991.

If the snow pack is decreasing, is overall precipitation also decreasing? Annual precipitation over the past 60 years appears to be steady, based on precipitation data measured at the Lehman Caves visitor center area from 1938-2003. The average amount of annual precipitation is 12.97 inches, with a maximum of 21.24 inches in 1982 and a minimum of 6.54 inches in 1950. How can the annual precipiation be steady while the amount of snow measured in the snow surveys is decreasing? One possible explanation is that more precipitation is falling later in the year. This could have huge consequences, since three fourths of the surface water is produced each year by melting of winter snowpacks (Wagner 1999, http://www.usgcrp.gov/usgcrp/Library/nationalassessment/newsletter/1999.08/rocky.htm).

Sage Grouse (continued)

lasting for two to four hours depending on temperature and wind. Displays started in March and lasted until the first week of May. All of the birds returned to the Baker Ranch by May 18, 2005, and will most likely stay in the lower parts of the valley until next spring.

A total of nine birds were observed, with just one of these a hen. Therefore, it is unknown how successful this year's reproduction was. It is possible that more hens were present but not seen due to the terrain and shrub cover. Monitoring the birds' movements will continue through the summer until the batteries on the transmitters lose their charge.

NPS Photo

A male sage grouse struts on the lek

For further information about sage grouse or to report their locations, please contact Neal Darby at 775-234-7331 ext. 232.

Research Reveals New Information

By Gretchen Baker

All researchers who conduct studies in the park are required to obtain a permit and report on their findings. In 2004, twenty research permits were issued for a variety of projects including climate change, plant genetics, and speleothem growth. The research helps park staff to better understand park resources and make informed decisions. Below are some of the highlights of recent research.

Dr. Eric Rickart and Shannen Robson from the Utah Museum of Natural History completed an inventory of small mammals of the park finding 53 species in the park and 20 species that are likely to be found in the park either now or in the near future. The study found that over the past 70 years, mid-elevation communities have shifted dramatically. Four of the five most abundant species in 1929, the least chipmunk, Great Basin pocket mouse, bushy-tailed woodrat, and desert woodrat were not recorded in 2000. Two species found in 2000, the Uintah chipmunk and pinyon mouse, were not recorded in 1929. These changes in fauna are believed to stem from a shift of the open habitat dominated by sagebrush to pinyon-juniper woodland. Lower elevation community structure has shifted slightly due to some smaller changes in plant composition, while the higher elevation communities have remained relatively stable.

A study by Dr. Erik Beever, Dr. David Pyke and other coauthors from the USGS established 31 permanent riparian transects for measurement of geomorphology, hydrology, vegetation, coarse woody debris and other variables. Detailed methods for future monitoring are included in their report. One of the conclusions of the study is that Engelmann spruce trees in the park are moving upward in elevation. In just nine years, this temperature sensitive species' lowest boundary has moved up 175 to 200 meters in elevation in three of the four drainages studied, presumably to avoid the heat. Other tree species do not appear to be affected.

Dr. Franco Biondi and Scotty Strachan from the University of Nevada at Reno have been studying the long-term climate, water supply, and fire regime of the Great Basin region by using tree-ring analysis of long-lived tree species. They collected a number of tree ring samples from ponderosa pines in the park, finding tree rings dating back to 1490, and from pinyon pines, with tree rings back to 1449.

Other researchers are undertaking long-term studies to inventory and learn more about truffles and false-truffles in the park, butterflies and moths, macroinvertebrates, and bryophytes (mosses).

Photo by G. Baker, NPS

Researcher George Gruell retakes photos of wildlife habitat. The original photos were taken near the turn of the century and show many fewer trees.

Research in 2005 will include studies looking at paleolimnology (the study of lake history), geologic structures in the Snake Range, distribution of rare alpine and subalpine plants, and a microbiological survey of Halliday's Deep Cave among others. To learn more about research in the National Park Service, visit http://science.nature.nps.gov/research/.

Useful Websites for Learning More about the Park and the Great Basin Region:

Offical Park Website: www.nps.gov/grba

Park Weather: http://www.aws.com/aws_2001/asp/obsForecast.asp?zipcode=89311

Lehman Creek Stream Gage: http://waterdata.usgs.gov/nv/nwis/ Click on Real-time and then on the map.

Great Basin Geology: http://www2.nature.nps.gov/geology/parks/grba/index.htm

Great Basin Wildflowers: http://www.suu.edu/faculty/martin/Provinces/greatbasin/basinflowers.htm

National Wildland Fire Information: http://www.nifc.gov/

Great Basin National Park Area Businesses: http://www.greatbasinpark.com/

Great Basin Heritage Website http://www.greatbasinheritage.org

Bighorn Sheep Habitat Restoration

By Neal Darby

Bighorn sheep are rare in the South Snake Range, with an estimated population of only twelve individuals. One of the reasons for the low population numbers is a lack of appropriate habitat. The steep, rocky areas they prefer still exist, but trees have encroached on grasslands between these cliffs. Since bighorns depend on their sight and more trees reduce visibility, bighorn sheep now have less of a chance to detect predators like mountain lions.

Photo by G. Baker, NPS

Three bighorn rams visit Johnson Lake in August

Resource Management staff have identified areas for enhancing and restoring bighorn sheep habitat using prescribed fire. This summer staff will conduct vegetation, composition, visibility and topographic surveys to determine which areas will be burned first. The vegetation surveys will ensure that after a site has been burned, it will produce plants favored by bighorn sheep. The visibility surveys determine the quantity of a cover board that can be seen through the existing vegetation. If the proposed units already afford high visibility, they would not be modified. Topographic surveys will ensure the areas contain steep slopes with broken rock outcrops.

This baseline information will help resource staff plan the prescribed fire treatments as well as monitor how well bighorn sheep are responding to the treatments.

Carnivore Tracking

by Gretchen Baker

The mountain lion (*Puma concolor*) is one of the most difficult animals to study due to its secrecy and nocturnal behavior, thus very little is known about it in Great Basin National Park. During the winter of 2004-05, park staff studied mountain lion and other carnivore winter use in the park using track surveys, wildlife observation reports, and remote cameras.

Ski transects in Strawberry, Lehman, Baker, and Snake Creeks were visited throughout the winter to search for tracks. Twelve transects, or 104 half-kilometer segments, were completed. Forty-five segments included carnivore tracks (tracks from the same animal were only counted in the first segment in which they were found). The most predominant carnivore tracks were left by foxes in 18 track segments, followed by unknown carnivore (n=11), coyote (n=7), weasel (n=4), mountain lion (n=3), and bobcat (n=2). No skunk tracks were found. Herbivore tracks were also counted, with the most predominant tracks left by rabbits in 71 track segments, followed by rodents (n=69), deer (n=40), turkey (n=6), and porcupine (n=1). No elk tracks were found.

Multiple mountain lion sightings were also documented with wildlife observation reports (see next article). Three mountain lion kill sites were verified during the winter and spring of 2005, and the third was so fresh that park staff installed a remote camera. That evening the mountain lion returned and dragged the deer carcass across the Baker Creek road. Park staff found the carcass and reinstalled the camera, capturing some incredible action photos.

Mountain lions and other carnivores will be monitored throughout the summer with remote cameras and wildlife observations. If you see carnivores in the park, please contact the resource management office.

Mountain lion at deer carcass. Photos taken by remote camera triggered by infrared sensor.

Wildlife Observation Reports

By Ryan Thomas and Meg Horner

Visitors and park employees are helping to monitor the park's wildlife by reporting their observations. The observations help the Resource Management staff in many valuable ways. With such a small staff at the park looking for wildlife, reports can help lead us to rare or elusive species that normally would not have been seen. In addition, we input the reports into a database each year and analyze it to determine if various species are staying in the same locations from year to year and to estimate if the populations are increasing or decreasing.

The park began systematically collecting wildlife observations in 1988, and since that time 475 reports have been submitted. From January 2004 to May 2005, 171 observations have been reported (Table 1), most of them in the Lehman Creek area, along the Baker Creek roads and the areas surrounding the Visitor Center and residential area in the park. The most common sighting were of marmots (n=20), bobcats (n=19), coyotes (n=18), and mountain lions (n=13). Common species such as mule deer and black-tailed jack rabbit are generally not reported because they are seen so often.

While analyzing the data, some reports stand out because they include species found in areas that are out of their normal range or time period. These include marmots seen on the Baker Creek road as early as March 2005, and marmots seen along Snake and Strawberry Creeks as well as Upper Lehman Campground and Mather overlook. A coyote was spotted last fall on the west side of Wheeler peak just below treeline, much higher than usual. Non-native turkeys were released outside the park in 2004, and observation reports have documented their invasion of nearly every park watershed.

A badger, usually seen on the valley floors, was spotted near Mather overlook. Two bighorn sheep visited the lower Scenic Drive in December 2004. Elk are usually spotted in

Yellow-bellied Marmot

Strawberry Creek, but have also been seen in Decathon Canyon, Kious Basin, and Snake, Baker, Lehman and Mill Creek drainages. Weasels have been found from near the park boundary up to the glacier area. A report of fireflies at the Baker Creek campground helps us pinpoint when they were there that year—fireflies have thus far only been seen in that area of the park.

If you see wildlife you don't normally see or see it at a strange time, please report it! We are especially interested in reports of marmots, skunks (striped and spotted), porcupines, ringtails, weasels (short and long-tailed), lions, bobcats, foxes, kingsnakes, ringnecked snakes, and pygmy rabbits, as well as any sightings you think are noteworthy. If in doubt, report it! Wildlife Observation Report forms are available at the Lehman Caves and Great Basin Visitor Centers. Thanks in advance for your help.

Table 1. Wildlife Observation Reports from January 2004 to May 2005.

Animal Species	Number of Reports
Badger	7
Bat (Unknown)	1
Bighorn Sheep	4
Bobcat	19
Bobcat tracks	2
Coyote	18
Coyote tracks	1
Elk	4
Ermine	1
Gray Fox	11
Gray Fox tracks	1
Kit Fox	11
Red Fox	3
Fox (Unknown)	4
Long billed Curlew	1
Long-tailed Weasel	1
Marmot	20
Marsh hawk	1
Marten	1
Mountain Lion	13
Mountain Lion kill site	4
Mountain Lion tracks	13
Raccoon	2
Ringtail	7
Skunk (Striped)	5
Skunk (Unknown)	3
Turkey	10
Weasel	2
Western Screech Owl	1
Total Number of Reports	171

Snake Food

By Bryan Hamilton

Have you ever wondered what snakes eat? Many people recognize that snakes are important controls on rodent populations, but different species of snakes have varied feeding strategies that may be a surprise. Food preferences are an important component of a species' overall habits.

Predators like snakes always occur in smaller numbers than their prey. For example, the Utah mountain kingsnake may feed primarily on relatively uncommon Western skinks. This means that kingsnakes will be even less common than their already uncommon prey.

The birth of many snake species occurs at the same time as the birth and increased populations of their prey. Since much of the prey consumes pine nuts, rattlesnake reproduction in the Great Basin is closely correlated with pinyon pine nut production. Two years after good pine nut years, rattlesnake reproduction peaks. Prey may also limit the distribution of their predators. Long-nosed snakes feed primarily on Great Basin whiptail lizards and will not be found in habitats that do not also support whiptails.

There are many ways to learn what types of food an animal eats. Direct observation is simplest, but because snakes are so secretive, it is also the most difficult. As secretive predators feeding near the trophic peak of the food web, observing a snake feeding in the wild is a relatively rare occurrence.

After feeding, snakes change their behavior. Snakes that have recently fed hide under a rock or wood with only a lump (the recently consumed prey) exposed to sunlight. This often makes them easier to find and more vulnerable to predators themselves.

The most important way that herpetologists have studied the feeding ecology of snakes is through the dissection of preserved snake specimens. Many museums have large collections of snakes available for examination. The Monte L. Bean Museum of Life Sciences, Brigham Young University houses over 30,000 reptile and amphibian specimens. Such collections allow a large sample of snakes to be dissected. Even with these large samples, relatively few food items are found. Snakes do not feed regularly and only about 10% of specimens examined contain food items. Through careful dissection and examination of stomach remains and fecal contents, a picture of the feeding ecology of a species emerges. Our understanding of snake feeding ecology is primarily based on studies of preserved specimens housed in universities such as BYU.

The most common snake in the Great Basin is the Great Basin Rattlesnake (*Crotalus oreganus lutosus*). Rattlesnakes are venomous, ambush predators. When a rodent approaches, the snake strikes, injects venom and releases the prey item. A few minutes later the snake's tongue flicking rate increases, and it tracks the mouse's trail via its sense of smell. Upon finding the now dead rodent, the snake swallows it head first. The venom has two major advantages. It allows the snake to minimize contact with the potentially dangerous food item and begins digestion from the inside out. Great Basin Rattlesnakes undergo a change in food preferences as they mature from babies to adults. Young rattlesnakes feed primarily on lizards and small mice while adults feed primarily on rodents like mice, woodrats, and chipmunks.

Photo by B. Hamilton, NPS

Snake gorging on a baby American robin

Snake Food (continued)

Another common Great Basin snake is the Great Basin gophersnake (*Pituophis catenifer deserticola*). Gophersnakes are known locally as "blowsnakes" for the characteristic noise they make when disturbed. Gophersnakes feed on a wide variety of prey. They are frequent nest raiders, invading underground rodent nests and birds' tree nests and feeding on the young nestlings. They will also feed on larger birds and rodents which they kill by constriction.

Striped whipsnakes (*Masticophis taeniatus*), known locally as "racers," feed primarily on diurnal lizards. They are active foragers with binocular vision and they use their quickness to catch lizards. Whipsnakes also consume rodents and snakes, with several documented cases of cannibalism.

Wandering gartersnakes (*Thamnophis elegans*) are known locally as "water snakes" for their preferred habitats: springs, streams, and wetlands. Gartersnakes often feed on fish, amphibians, and small invertebrates such as worms, with larger individuals occasionally feeding on mice and birds.

The Long-nosed snake (*Rhinocheilus lecontei*) is a true feeding specialist. Approximately half of its diet is comprised of whiptail lizards, with reptile eggs and small mammals making up the remainder of its diet.

Nightsnakes (*Hypsiglena torquata*) feed almost exclusively on small lizards (sagebrush and side-blotched lizards) and reptile eggs. Nightsnakes are venomous to their prey but are harmless to humans as they are unable to inject venom into humans.

The distribution of the racers (*Coluber constrictor*) in the vicinity of Great Basin National Park is limited to northern Spring Valley. Contrary to its scientific name, racers are not constrictors. Racers are opportunistic predators and feed on insects, snakes, lizards, and rodents.

Utah mountain kingsnakes (*Lampropeltis pyromelana infralabialis*) are infrequently encountered in the Great Basin. They feed on lizards and rodents, and less frequently on small snakes.

The ringneck snake (*Diadophis punctatus*) is the rarest snake in the Great Basin. Because of the lack of records of this species, its food habits in the Great Basin are unknown. In other western portions of its range, ringnecks feed primarily on lizards and insects and are mildly venomous, but like the nightsnake, harmless to humans.

Due to their wide variety of feeding habitats, snakes of the Great Basin occupy many habitats. They are important factors to keeping prey populations in balance. Near the top of the food chain, snakes also reflect the cyclical nature of food sources.

The Midden is now being distributed in full color PDF format by email. If you would like to be added to the distribution list, please email Gretchen_Baker@nps.gov.

Why Are So Many Trees Dying?

You may have noticed many more dead and dying trees in the park this year than in past years. One of the main causes is an outbreak of the fir engraver bark beetle (*Scolytus ventralis*), which attacks white firs.

Photo by G. Baker, NPS

White fir kill in Baker Creek campground

The outbreak is caused by stressed white fir trees, which have suffered from several years of drought.

The beetles burrow under the bark and kill a strip of cambium near its gallery to successfully reproduce. The fir engraver beetle infestation may result in a few dead branches, a top kill, or complete tree mortality.

Although the dead trees may not be aesthetically pleasing, fir engraver beetles are a natural part of ecosystem processes. They are further evidence of how difficult it is to survive in the harsh Great Basin climate, where water is a limiting factor for most species.

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The Midden is the Resource Management newsletter for Great Basin National Park.

A spring/summer and fall/winter issue are sent out each year. The Midden is also available on the Park's website at www.nps.gov/grba.

We welcome submissions of articles or drawings relating to natural and cultural resource management and research in the park. They can be sent to:
Resource Management,
Great Basin National Park,
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Or call us at: (775) 234-7331

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EXPERIENCE YOUR AMERICA

What's a midden?

A midden is a fancy name for a pile of trash, often left by pack rats. Pack rats leave middens near their nests, which may be continuously occupied for hundreds, or even thousands, of years. Each layer of trash contains twigs, seeds, animal bones and other material, which is cemented together by urine. Over time, the midden becomes a treasure trove of information for plant ecologists, climate change scientists and others who want to learn about past climatic conditions and vegetation patterns dating back as far as 25,000 years. Great Basin National Park contains numerous middens.

Great Basin National Park

News Briefs

Water in Osceola Ditch

Water was seen flowing in the Osceola Ditch this year. The 18-mile ditch, built from 1880-1890 and in operation from 1890 to 1901, carried water from Lehman Creek and other drainages on the east and north side of the South Snake Range to the mining town of Osceola. Due to drought, leaks, and economic reasons, the ditch was short-lived. Several years ago, volunteers cleared the ditch from the Wheeler Peak Scenic Drive to Strawberry Creek, opening up the mostly flat trail to foot travel. The beginning section of the Osceola trail is right in the ditch, and during May, snow melt filled parts of the ditch in the Burnt Mill and Mill Creek watersheds.

Photo by M. Stephens, NPS

Osceola ditch with flowing water

Wild Cave Permits

Are you an experienced caver that would like to see one of the eight permitted caves in Great Basin National Park? The caves vary from horizontal to vertical, dry to wet, and not strenuous to quite strenuous. Caves are closed during parts of the year when they are being used by bats or for other special concerns. Contact cave specialist Matt Reece at (775) 234-7331 x228 for more information if you're interested. This year's closure dates:

Upper Pictograph	3/25-9/10
Little Muddy	4/1-10/1*
System's Key	11/15-4/15
Ice	10/15-9/10
Crevasse/Halliday's	10/15-9/10
Wheeler's Deep	4/1-8/1
Snake Creek	No closure
Model	Water Dependent

* Or if CO_2 levels exceed NPS standards

Creel Surveys

During the 2005 summer season, the park will conduct voluntary creel surveys on four park streams. The surveys will help determine how many people fish in park streams, what kind of fish they are catching, and what type of gear they are using. The information obtained will help the park better manage the fisheries resources. Check the next issue of The Midden for the results!